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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/909,074

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Joyce S.Oey Hewett

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EXAMINER

NGUYEN, KHIEM D

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 01/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 09/909,074	Applicant(s) HEWETT ET AL.	
	Examiner Khiem D Nguyen	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2004.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-13 and 15-41 is/are pending in the application.
- 4a) Of the above claim(s) 16-41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-13 and 15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 4-13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson et al. (U.S. Pub. 2002/0032499) in view of Uzoh et al. (U.S. Patent 6,685,814).

In re claim 1, Wilson et al. disclose a method of controlling a conductive layer deposition process comprising (See page3, paragraphs [0023]- [0025] and FIGS. 1 and 4): depositing a conductive layer such as copper above a first semiconductor wafer based upon a deposition recipe (page 1, paragraphs [004] and [0008] and page 7, paragraph [0061]); measuring a thickness of the conductive (copper) layer deposited on the semiconductor wafer and determining whether the measured thickness of the conductive (copper) layer is within a predetermined tolerance 76 (page 5, paragraph [0042] and FIG. 4); and, revising the deposition recipe according to at least one predetermined model if the measured thickness of the conductive (copper) layer is not within the predetermined tolerance 78 (page 5, paragraph [0042] and FIG. 4).

Wilson et al. do not explicitly disclose revising at least one parameter selected from the group consisting of a chemical concentration of an electroplating bath and an anode-cathode spacing of the deposition recipe if the measured thickness of the

conductive layer is not within the predetermined tolerance as recited in the independent claim 1.

Uzoh et al., however, disclose that the thickness of an electroplated conductive layer may be affected by revising at least one parameter selected from the group consisting of a chemical concentration of an electroplating bath (col. 2, lines 49-62). In view of recognition that the chemical concentration of an electroplating bath affect the thickness of the conductive layer, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teaching of Wilson et al. and Uzoh et al. to achieve or revising the deposition recipe in Wilson by altering the chemical concentration and furthermore to produce more uniform electroplated film in electroplating processes (col. 2, lines 57-62).

In re claims 2 and 5, Wilson et al. disclose wherein depositing a conductive layer above the first semiconductor wafer further comprises deposition a copper layer above a first semiconductor wafer (page 1, paragraphs [004] and [0008] and page 7, paragraph [0061]); measuring the thickness of the conductive layer further comprises measuring the thickness of the copper layer; determining whether the measured thickness of the conductive layer is within a predetermined tolerance further comprises determining whether the measured thickness of the copper layer is within the predetermined tolerance (page 5, paragraph [0042] and FIG. 4); and, revising the deposition recipe according to at least one predetermined model further comprises revising the deposition recipe if the measured thickness of the copper layer is not within the predetermined tolerance (page 5, paragraph [0042] and FIG. 4);

In re claim 4, Wilson et al. disclose using the newest parameter derived in step 80 (FIG. 4) in processing subsequent microelectronic workpieces (paragraph [0042]). Therefore, Wilson inherently teaches depositing a conductive layer above a second semiconductor wafer based upon the revised deposition recipe.

In re claims 6-8, Wilson et al. disclose a method of controlling a conductive layer deposition process comprising (page 3, paragraph [0025] and FIGS. 1 and 4): depositing a conductive layer such as copper above a first semiconductor wafer based upon a deposition recipe (page 1, paragraph [004] and [0008] and page 7, paragraph [0061]); measuring a thickness of the conductive (copper) layer at a plurality of predetermined pattern of locations (page 7, paragraph [0061] and Table 1); calculating a value representing the measured thickness measured at the plurality of locations (page 9, paragraph [0088]); determining whether the calculated value is within a predetermined tolerance (page 5, paragraph [0042] and FIG. 4); and, revising the deposition recipe based upon at least the calculated value if the calculated value is not within the predetermined 78 (page 5, paragraph [0042] and FIG. 4).

Wilson et al. do not explicitly disclose revising at least one parameter selected from the group consisting of a chemical concentration of an electroplating bath and an anode-cathode spacing of the deposition recipe based upon at least the calculated value if the calculated value is not within the predetermined tolerance as recited in independent claim 6.

Uzoh et al., however, disclose that the thickness of an electroplated conductive layer may be affected by revising at least one parameter selected from the group

consisting of a chemical concentration of an electroplating bath (col. 2, lines 49-62). In view of recognition that the chemical concentration of an electroplating bath affect the thickness of the conductive layer, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teaching of Wilson et al. and Uzoh et al. to achieve or revising the deposition recipe in Wilson by altering the chemical concentration and furthermore to produce a more uniform electroplated film in electroplating processes (col. 2, lines 57-62).

In re claims 9 and 10, **Wilson et al** disclose calculating a value representing the measured thickness comprises calculating an average (arithmetic mean) of the plurality of thickness measurements (page 9, paragraph [0088]).

In re claims 11 and 12, **Wilson et al.** disclose wherein determining whether the calculated value is within a predetermined tolerance 76 comprises calculating a measure of a degree of dispersion of the plurality of thickness measurements about the calculated value and comparing the measure of the degree of dispersion to a predetermined statistical distribution selected from the group consisting of the standard deviation (normal distribution) (page 9, paragraphs [0088] and [0091] and page 5, paragraph [0042] and FIG. 4).

In re claim 13, **Wilson et al.** disclose wherein revising the deposition recipe further comprises revising the deposition recipe according to at least one predetermined model (page 5, paragraphs [0042]-[0043]).

In re claim 15, **Wilson et al.** disclose using the newest parameter derived in step 80 (FIG. 4) in processing subsequent microelectronic workpieces (paragraph [0042]).

Therefore, Wilson inherently teaches depositing a conductive layer above a second semiconductor wafer based upon the revised deposition recipe.

***Response to Applicants' Amendment and Arguments***

Applicants' arguments filed October 26<sup>th</sup>, 2004 have been fully considered but they are not persuasive.

Applicants contend that Uzoh fails to disclose or suggest any aspect of revising the chemical concentration of the electroplating bath. Applicants further stated that Uzoh cannot render the present invention set forth in claims 1 and 6 obvious because it fails to disclose revising the chemical concentration of the electroplating bath.

In response to Applicants' argument that Uzoh in combination with Wilson fails to disclose or suggest revising the chemical concentration of the electroplating bath, Examiner respectfully disagrees. Both Wilson and Uzoh related to a method of controlling a conductive layer deposition process using electroplating bath (page 1, paragraphs [0007]-[0008], Wilson) and (col. 2, lines 49-62, Uzoh). It is inherent that in every electroplating bath process the plating measured thickness of the conductive layer is proportional to the chemical concentration. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to revise the at least one parameter as taught by Wilson from the group consisting of a chemical concentration of an electroplating bath to achieve or revising the deposition recipe in Wilson. Furthermore, because the phrase "if" as recited in claim 1, line 9 and claim 6, line 10 is not a positive process. The step of revising at least one parameter selected from the group consisting of a chemical concentration of an electroplating bath and an anode-

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cathode spacing of the deposition recipe does not have to be conducted when the measured thickness of the conductive layer is within the predetermined tolerance.

For these reasons, examiner holds the rejection proper.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K.N.  
January 2<sup>nd</sup>, 2005



**W. DAVID COLEMAN  
PRIMARY EXAMINER**